UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/776,427 | 02/11/2004 | George M. Whitesides | H0498.70079US01/TJO | 4054 |

7590 01/05/2007

Timothy J. Oyer, Ph.D.
Wolf, Greenfield & Sacks, P.C.
600 Atlantic Avenue
Boston, MA 02210

| EXAMINER | |
|---|---|
| DICUS, TAMRA | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1774 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 01/05/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/776,427 | WHITESIDES ET AL. | |
| | Examiner | Art Unit | |
| | Tamra L. Dicus | 1774 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *18 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *3-15,55-59 and 69-75* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-15,55-59 and 69-75* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

The RCE is acknowledged.

### *Double Patenting*

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 3-15, 55-59, and 69-75 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13 of USPN 5,776,748 to Singhvi et al. ('748 Sin) and claims 1-15 of USPN 5,976,826 to Singhvi et al. ('826 Sin).

Although the conflicting claims are not identical, they are not patentably distinct from each other because the first and second molecular species as instantly claimed, are considered to be the cytophobic and cytophilic regions as patented claims 1-6 recite ('748 Sin) and patented claims 1-15 ('826 Sin). Further the instant ranges are within the claimed ranges of '748 Sin (see patented claims 1-6) and patented claims 2-13 ('826 Sin). The termination of ends are provided by Singhvi the pattern bridge and contact, equivalent to the binding features as instantly claimed. See also col. 9, lines 54-60 and col. 11, lines 30-68 to the island material description ('748 Sin).

Furthermore, the present claims are broader in scope and encompasses that which is claimed by the Singhvi references.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 3-10 are rejected under 35 U.S.C. 102(b) as being anticipated by USPN 4,728,591 to Clark et al.

Clark teaches a device comprising: an article defining a surface (col. 2, line 32, e.g. substrate surface); and an isolated region of a self-assembled monolayer of a first molecular species having a function (col. 2, lines 49-55, e.g. a functional material deposited through holes such as a protein and enzymes molecules) surrounded by a second molecular species on the surface and terminating in the same way (e.g. at the ends of the pattern as per Applicant's specification-see [0053-0059]) (col. 2, lines 40-49, FIG. 2 and associated text, . two-dimensional self-assembled molecular array of protein and enzymes molecules). The isolated region in lateral dimension and area (encompassed by characteristic dimension) is between 1-50 nm (.01-.5 microns), meeting Applicant's range of less than about 10 microns, 5 microns, 1 micron, and 0.25 microns, less than 100 sq. microns, less than 25 microns, less than 1 sq. microns, and less than 0.06 microns, as the first material is surround by the pattern via the second molecular species, see col. 3, lines 56-59 and col. 4, lines 40-45. The terminations of the second molecular species and the first

being on and exposed away from the surface are defined by the pattern as shown in FIG. 2 and associated text, see where 20 is bound to 12, thus bind to surface 10 (col. 13, line 60-col. 14, lines 1-40, col. 14, lines 50-col. 15, line 30, cationic polylysine serve to bind to anionic ferritin). See also patented claims and col. 8, lines 1-5. Claims 3-10 are met.

Claims 55-59 and 69 are rejected under 35 U.S.C. 102(b) as being anticipated by USPN 5,079,600 to Schnur et al.

Schnur teaches a patterned monomolecular assembly having a nonplanar substrate such as a palladium coated silicon wafer that exhibits excellent step coverage important in fabrication of the wafer used in semiconductor microlithography (Example 23, Abstract, Example 25). Schnur also teaches the functional groups terminating at one and other ends in a monomolecular self-assembling film being chemisorbed in the same way as Applicant (see Example 1). Schnur teaches microlithography patterns can be used from the background explaining the pattern line widths having less than one micron (equivalent to lateral dimension) is suitable for microcircuit lithography (col. 1, lines 60-68, col. 6, lines 45-68, col. 8, lines 1-68, col. 9, lines 15-68, col. 10, lines 1-4, lines 40-65, col. 11, lines 15-20, FIGS. 1A-3B and associated text) suitable for patterning (instant claims 55-59 and 69 are met).

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 4,728,591 to Clark et al. and USPN 5, 079,600 to Schnur et al.

Clark essentially teaches the claimed invention above, as applied to claim 1.

Regarding claims 11, and 14-15, Clark does not teach a nonplanar surface on the silicon substrate, while Clark teaches a substrate of silicon (col. 3, line 63).

Schnur teaches a patterned monomolecular assembly having a nonplanar substrate such as a silicon wafer that exhibits excellent step coverage important in fabrication of the wafer used in semiconductor microlithography (Example 23, Abstract, Example 25).

It would have been obvious to one having ordinary skill in the art to have modified the silicone substrate of Clark to further provide a nonplanar surface because Schnur teaches the nonplanar silicon wafer exhibits excellent step coverage important in fabrication of a wafer substrate used in a semiconductor (Example 23, Abstract, Example 25, Schnur). Thus, the claimed invention would produce the same invention and perform in the same way as Applicant as the same materials are provided by the prior art.

Regarding claims 12-13, Clark does not teach the surface of the silicon substrate having or in a hydrophilic and hydrophobic functionality.

Schnur teaches a patterned molecular assembly having a substrate comprising silicon and palladium where the surface of a n-type silicon wafer has an hydrophilic and hydrophobic functionality because the surfaces are both hydrophilic and hydrophobic, where when contacted with water on the hydrophilic surface it spread to form a film thereon and when the surface was silanized the surface was hydrophobic by a technique to pattern the substrate and enable a

monomolecular film to be chemisorbed onto the silicon substrate (Abstract, Example 1). Schnur also teaches the functional groups terminating at ends in a monomolecular self-assembling film (col. 1, lines 60-68, col. 6, lines 45-68, col. 9, lines 15-68, col. 10, lines 1-4, lines 40-65, col. 11, lines 15-20) suitable for patterning.

It would have been obvious to one having ordinary skill in the art to have modified the silicone substrate of Clark to provide a hydrophilic and hydrophobic functionality as claimed because Schnur teaches the surfaces are both hydrophilic and hydrophobic, where when contacted with water on the hydrophilic surface it spread to form a film thereon and when the surface was silanized the surface was hydrophobic by a technique to pattern the substrate and enable a monomolecular film to be chemisorbed onto the silicon substrate (Abstract, Example 1, col. 1, lines 60-68, col. 6, lines 45-68, col. 9, lines 15-68, col. 10, lines 1-4, lines 40-65, col. 11, lines 15-20). Thus, the claimed invention would produce the same invention and perform in the same way as Applicant as the same materials are provided by the prior art.

Claims 55-59 and 69-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 4,728,591 to Clark et al. and USPN 5, 079,600 to Schnur et al.

Regarding claims 55-59 and 69-75, Clark teaches a device comprising: an article defining a surface (col. 2, line 32, e.g. substrate surface); and an isolated region of a self-assembled monolayer of a first molecular species having a function (col. 2, lines 49-55, e.g. a functional material deposited through holes such as a protein and enzymes molecules) surrounded by a second molecular species on the surface and terminating in the same way (e.g. at the ends of the

pattern as per Applicant's specification-see [0053-0059]) (col. 2, lines 40-49, FIG. 2 and associated text, . two-dimensional self-assembled molecular array of protein and enzymes molecules). The isolated region in lateral dimension and area (encompassed by characteristic dimension) is between 1-50 nm (.01-.5 microns), meeting Applicant's range of less than about 10 microns, 5 microns, 1 micron, and 0.25 microns, less than 100 sq. microns, less than 25 microns, less than 1 sq. microns, and less than 0.06 microns, as the first material is surround by the pattern via the second molecular species, see col. 3, lines 56-59 and col. 4, lines 40-45. The terminations of the second molecular species and the first being on and exposed away from the surface are defined by the pattern as shown in FIG. 2 and associated text, see where 20 is bound to 12, thus bind to surface 10 (col. 13, line 60-col. 14, lines 1-40, col. 14, lines 50-col. 15, line 30, cationic polylysine serve to bind to anionic ferritin). See also patented claims and col. 8, lines 1-5.

Further regarding claims 55 and 69, Clark does not teach a substrate comprising palladium, while Clark teaches a substrate of silicon (col. 3, line 63).

Schnur teaches a patterned molecular assembly having a substrate comprising silicon and the use of palladium on a wafer substrate produces a smooth coating (Example 23, Abstract, Example 25, Schnur),

It would have been obvious to one having ordinary skill in the art to have included palladium to the substrate of Clark because Schnur teaches a substrate of silicon and the use of palladium on a silicon wafer substrate produces a smooth coating (Example 23, Abstract, Example 25, Schnur). Thus, the claimed invention would produce the same invention and perform in the same way as Applicant as the same materials are provided by the prior art.

Claims 3-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,079,600 to Schnur et al. in view of USPN 4,728,591 to Clark et al.

Schnur teaches a patterned monomolecular assembly having a nonplanar substrate such as a silicon wafer that exhibits excellent step coverage important in fabrication of the wafer used in semiconductor microlithography (Example 23, Abstract, Example 25). Schnur also teaches the functional groups terminating at one and other ends in a monomolecular self-assembling film (col. 1, lines 60-68, col. 6, lines 45-68, col. 8, lines 1-68, col. 9, lines 15-68, col. 10, lines 1-4, lines 40-65, col. 11, lines 15-20, FIGS. 1A-3B and associated text) suitable for patterning (Instant claims 3-15 addressed).

Schnur does not teach a patterning having the surrounded regions as recited (instant claims 3-10, 14-15).

However, Schnur teaches microlithography patterns can be used from the background explaining the patterns having less than one micron is suitable for microcircuit lithography (cited above). Thus, because the cited claimed ranges are less than one micron, they fall within the prior art range.

Further, Clark explicitly teaches the required ranges are suitable in microlithography patterns. Clark teaches a device comprising: an article defining a surface (col. 2, line 32, e.g. substrate surface); and an isolated region of a self-assembled monolayer of a first molecular species having a function (col. 2, lines 49-55, e.g. a functional material deposited through holes such as a protein and enzymes molecules) surrounded by a second molecular species on the

surface and terminating in the same way (e.g. at the ends of the pattern as per Applicant's specification-see [0053-0059]) (col. 2, lines 40-49, FIG. 2 and associated text, . two-dimensional self-assembled molecular array of protein and enzymes molecules). The isolated region in lateral dimension and area (encompassed by characteristic dimension) is between 1-50 nm (.01-.5 microns), meeting Applicant's range of less than about 10 microns, 5 microns, 1 micron, and 0.25 microns, less than 100 sq. microns, less than 25 microns, less than 1 sq. microns, and less than 0.06 microns, as the first material is surround by the pattern via the second molecular species, see col. 3, lines 56-59 and col. 4, lines 40-45. The terminations of the second molecular species and the first being on and exposed away from the surface are defined by the pattern as shown in FIG. 2 and associated text, see where 20 is bound to 12, thus bind to surface 10 (col. 13, line 60-col. 14, lines 1-40, col. 14, lines 50-col. 15, line 30, cationic polylysine serve to bind to anionic ferritin). See also patented claims and col. 8, lines 1-5.

Thus, it would have been obvious to one having ordinary skill in the art to have modified Schnur because Schnur suggests microlithography patterns may be applied to the wafer and Clark teaches the wafer having the required microlithography patterns in nanoscale to produce complexes structures as cited above and Abstract of Clark.

Claims 70-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,079,600 to Schnur et al. in view of USPN 4,728,591 to Clark et al.

Schnur essentially teaches the claimed invention as applied to claim 69 above.

Schnur does not teach a patterning having the surrounded regions as recited (instant claims 70-75).

However, Schnur teaches microlithography patterns can be used from the background explaining the patterns having less than one micron is suitable for microcircuit lithography (cited above). Thus, because the cited claimed ranges are less than one micron, they fall within the prior art range.

Further, Clark explicitly teaches the required ranges are suitable in microlithography patterns. Clark teaches a device comprising: an article defining a surface (col. 2, line 32, e.g. substrate surface); and an isolated region of a self-assembled monolayer of a first molecular species having a function (col. 2, lines 49-55, e.g. a functional material deposited through holes such as a protein and enzymes molecules) surrounded by a second molecular species on the surface and terminating in the same way (e.g. at the ends of the pattern as per Applicant's specification-see [0053-0059]) (col. 2, lines 40-49, FIG. 2 and associated text, . two-dimensional self-assembled molecular array of protein and enzymes molecules). The isolated region in lateral dimension and area (encompassed by characteristic dimension) is between 1-50 nm (.01-.5 microns), meeting Applicant's range of less than about 10 microns, 5 microns, 1 micron, and 0.25 microns, less than 100 sq. microns, less than 25 microns, less than 1 sq. microns, and less than 0.06 microns, as the first material is surround by the pattern via the second molecular species, see col. 3, lines 56-59 and col. 4, lines 40-45. The terminations of the second molecular

species and the first being on and exposed away from the surface are defined by the pattern as shown in FIG. 2 and associated text, see where 20 is bound to 12, thus bind to surface 10 (col. 13, line 60-col. 14, lines 1-40, col. 14, lines 50-col. 15, line 30, cationic polylysine serve to bind to anionic ferritin). See also patented claims and col. 8, lines 1-5.

Thus, it would have been obvious to one having ordinary skill in the art to have modified Schnur because Schnur suggests microlithography patterns may be applied to the wafer and Clark teaches the wafer having the required microlithography patterns in nanoscale to produce complexes structures as cited above and Abstract of Clark.

***Response to Arguments***

Applicant's arguments have been fully considered but they are not persuasive and moot in view of the new ground of rejection.

Applicant argues the 102(b) rejection over Clark stating that the although Clark teaches a self-assembled molecular array, it is not a self-assembled monolayer. However, Clark clearly teaches the same meaning despite different wording.

Applicant argues Clark does not teach a functional group as instantly claimed, however, the same material is employed –binding type material as set forth above.

Schnur also teaches the same type of material having terminal groups and ends as recited.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tamra L. Dicus whose telephone number is 571-272-1519. The examiner can normally be reached on Monday-Friday, 7:00-4:30 p.m., alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on 571-272-3186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Tamra L. Dicus
Examiner
Art Unit 1774

December 29, 2006

RENA DYE
SUPERVISORY PATENT EXAMINER
Art Unit 1774